

CLAIMS

1. An exposure apparatus comprising:

5 a measuring unit which irradiates a measurement light beam via a measurement optical system to an object to be measured and measures information about position of the object to be measured;

10 a holding member which holds the measurement optical system; and

a temperature adjusting unit which adjusts a temperature of the holding member.

2. An exposure apparatus according to claim 1, further comprising:

15 a gas supply unit which supplies gas whose temperature has been adjusted to a space including an optical path of the light beam; and

20 a control unit which controls at least one of the temperature adjusting unit and the gas supply unit such that a temperature of gas from the gas supply unit and a temperature of the holding member coincide with each other.

3. An exposure apparatus according to claim 1, further comprising:

25 a gas supply unit which supplies gas whose

temperature has been adjusted to an optical path of the light beam in a space where the object to be measured is arranged,

wherein the measurement optical system and at least part of the holding member are provided in the space.

4. An exposure apparatus according to claim 3, wherein using at least one of the temperature adjusting unit and the gas supply unit, a temperature of the gas is made to substantially coincide with a temperature of the at least part of the holding member provided in the space.

5. An exposure apparatus according to claim 1, wherein the object to be measured is at least one of a mask having a pattern formed thereon and a substrate onto which the pattern is to be transferred.

6. An exposure apparatus according to claim 5, wherein the measuring unit includes an interferometer which irradiates the light beam to a stage on which the object to be measured is mounted.

7. An exposure apparatus according to claim 6, further comprising:

a projection optical system which projects the mask pattern onto the substrate,

wherein the measuring unit includes a focus

sensor which detects information about position of the object to be measured in a direction parallel to an optical axis of the projection optical system.

8. An exposure apparatus according to claim 5,
5 further comprising:

a projection optical system which projects the mask pattern onto the substrate,

wherein the measuring unit includes at least one of an interferometer which irradiates the light
10 beam to a stage on which the object to be measured is mounted, a focus sensor which detects information about position of the object to be measured in a direction parallel to an optical axis of the projection optical system, and an alignment sensor
15 which detects a mark on the stage.

9. An exposure apparatus according to claim 8, further comprising:

a frame on which the projection optical system is mounted,

20 wherein the holding member is fixed to the frame.

10. An exposure apparatus according to claim 5, wherein the temperature adjusting unit comprises a heat exchange member fixed to the holding member and a
25 circulation unit which circulates fluid whose

temperature has been adjusted in the heat exchange member.

11. An exposure apparatus provided with a projection optical system which projects illumination light irradiating a first object onto a second object,
5 the exposure apparatus comprising:

a frame to which the projection optical system is fixed;

a measuring unit of which at least part is
10 provided on the frame, which irradiates a measurement beam to an object to be measured and measures information about position thereof; and

a temperature adjusting unit which adjusts a temperature of the part of the measuring unit provided
15 on the frame and a holding member holding the part.

12. An exposure apparatus according to claim 11, further comprising:

a gas supply unit which supplies gas whose temperature has been adjusted to a space including an
20 optical path of the measurement beam,

wherein the part of the measuring unit provided on the frame is held by the holding member in the space, and wherein a temperature of the gas and a temperature of the part of the measuring unit provided
25 on the frame and the holding member holding the part

are made to substantially coincide with each other by at least one of the temperature adjusting unit and the gas supply unit.

13. An exposure apparatus according to claim 12,
5 wherein the object to be measured is at least one of the first and second objects, and wherein the measuring unit includes at least one of an interferometer which irradiates the measurement beam to a stage on which the object to be measured is
10 mounted, a focus sensor which detects information about position of the object to be measured in a direction parallel to an optical axis of the projection optical system, and an alignment sensor which detects a mark on the stage.

15 14. An exposure apparatus according to claim 13, wherein the measuring unit includes at least the interferometer, and the interferometer detects position information of the stage in a plane orthogonal to the optical axis of the projection
20 optical system and a relative positional relationship in a direction parallel to the optical axis between the projection optical system and the stage.

15 15. An exposure apparatus which transfers a pattern of a first object onto a second object, the apparatus comprising:

a measuring unit which irradiates a measurement beam and measures information about position of an object to be measured;

5 a gas supply unit which supplies gas whose temperature has been adjusted to a space including an optical path of the measurement beam;

a holding member which holds at least part of the measuring unit in the space; and

10 a temperature adjusting unit which makes a temperature of the gas and a temperature of one of the holding member and the at least part of the measuring unit substantially coincide with each other in the space.

15 16. An exposure apparatus according to claim 15, wherein the object to be measured is at least one of the first and second objects, and wherein the measuring unit includes an interferometer which irradiates the measurement beam to a stage on which one of the object to be measured is mounted.

20 17. An exposure apparatus according to claim 16, wherein the holding member is fixed to a frame provided separately from a base member on which the stage is arranged.

25 18. An exposure apparatus according to claim 16, further comprising:

a projection optical system which projects a pattern of the first object onto the second object,

wherein the interferometer detects information about a position of the stage in a plane orthogonal to an optical axis of the projection optical system and a relative positional relationship in a direction parallel to the optical axis between the projection optical system and the stage.

19. An exposure apparatus according to claim 16, further comprising:

a projection optical system which projects a pattern of the first object onto the second object,

wherein the measuring unit includes at least one of a focus sensor which detects information about position of the object to be measured in a direction parallel to an optical axis of the projection optical system, and an alignment sensor which detects a mark on the stage.

20. An exposure apparatus according to claim 16, wherein the temperature adjusting unit can adjust both a temperature of the gas and a temperature of one of the holding member and the at least part of the measuring unit independently of each other.

21. An exposure method for exposing a second object by illumination light via a first object having

a pattern, comprising the steps of:

supplying gas whose temperature has been
adjusted to a space including an optical path of a
measurement beam used to measure position information
5 of the second object,

making a temperature of one of at least part
of a measuring unit irradiating the measurement beam
and a holding member holding the part to substantially
coincide with a temperature of the gas,

10 measuring the position information of the
second object,

moving the second object based on the
measured position information.

22. An exposure method according to claim 21,
15 further comprising the steps of:

measuring a temperature of the gas in or near
an optical path of the measurement beam, and

adjusting at least one of a temperature of at
least part of the measuring unit or the holding member
20 and a temperature of the gas based on the measured
temperature.